[0001] A rapid coupling ~~having the features specified in the preamble of claim 1~~ is disclosed in EP 0 467 381 A1. ~~There,~~ ~~an~~ An engagement section is provided on the pipe nipple ~~on~~ in the form of an annular bead or groove which cooperates with a resilient locking element disposed inside the ~~bush~~ sleeve in such a way that the pipe nipple is retained in the ~~bush~~ sleeve by engagement between the locking element and the engagement section.

[0002] When the pipe nipple is pushed into the ~~bush~~sleeve, latching takes place between the locking element and the engagement which is as such audible and tangible. However, if mounting is done automatically or under ~~unfavourable~~ unfavorable working conditions, audible or tangible latching as an indicator of a complete locking has to be ruled out. Also in a subsequent inspection, the locking state can only be checked by trying to pull the pipe nipple out of the ~~bush~~sleeve, which is ~~labour~~labor-intensive and is not readily possible in the case of fully assembled machines.

Summary of the Invention

[0003] A general object of the invention is to overcome, at least in part, disadvantages as occur in comparable rapid couplings of the prior art. A more specific object of the invention may be seen in providing a rapid coupling in which the locking state between the pipe nipple and the ~~bush~~ sleeve can easily be ascertained.

[0004] This object is met by the present rapid coupling ~~defined in claim 1~~. ~~In the arrangement of claim 1, the~~The engagement section (groove or projection) is outside the ~~bush~~ sleeve and is thus visible when the pipe nipple and the ~~bush~~ sleeve are not properly coupled and thus not locked. Thus, the engagement section, in addition to its actual latching function with the locking element, assumes the additional task as an indicator of the locking state of the rapid coupling.

[0005] The ~~development of claim 2 is particularly advantageous in that the~~ compression spring again serves a double purpose, namely to bias the engagement between the locking element of the ~~bush~~ sleeve and the engagement section of the pipe nipple toward a defined position, on the one hand, and to ensure that the pipe nipple is pushed out of the ~~bush~~ sleeve in the unlocked state, so that the engagement section reliably fulfils the said indicator function, on the other hand.

[0006] ~~Claims 3 to 5, and claims 6 and 7 relate to expedient embodiments of the~~The present locking mechanisms, which are uncomplicated in production, ensure reliable locking and yet allow simple uncoupling.

Brief Description of the Drawing

[0007] Embodiments of the invention are explained in more detail below with reference to the drawing, in which:

[0008] Fig. 1 shows a rapid coupling, partly in axial section, in the coupled and locked state;

[0009] Fig. 2 is an enlarged detailed view of the locking region of the rapid coupling according to Fig. 1;

[00010] Fig. 3 shows the same coupling in the pushed-together, but not yet locked state; and

[00011] Fig. 4 is an illustration similar to Fig. 1 of a rapid coupling with a locking arrangement of different design.

Detailed Description of Embodiments

[00012] The rapid coupling shown in Fig. 1 comprises a ~~bush~~ sleeve **10** having a through-hole **11** and a pipe nipple **12** which can be inserted into said ~~bush~~ sleeve **10** and is to be coupled to the ~~bush~~sleeve. The ~~bush~~ sleeve **10** is provided, at its end remote from the insertion end **13** for the pipe nipple **12**, with an external thread **14** for screwing into a machine housing, for example a motor-vehicle engine block and, on a further part of its outer surface, with a hexagon **15**. Instead of a screw connection, the ~~bush~~ sleeve **10** may be formed as an insert part to be inserted into a corresponding hole of the machine housing and fastened therein by material displacement, as described in EP 0 467 381 A1.

[00013] The pipe nipple **12** is of cylindrical shape over its length to be inserted into the ~~bush~~ sleeve **10** and, in the embodiment of ~~to~~ Figs. 1 to 3, has an annular recess or groove **17** at some distance from its insertion end **16**. In the embodiment shown, the pipe nipple **12** is curved outside the ~~bush~~ sleeve **10**.

[00014] A helical compression spring **19** is disposed between the insertion end **16** of the pipe nipple **12** and an annular stop **18** formed in the interior of the through-hole **11** of the ~~bush~~ sleeve **10**, the outer diameter of the compression spring **19**, in the compressed state, being approximately equal to the inner diameter of the through-hole **11**. In the embodiment shown, the stop **18** is located at the end of the ~~bush~~ sleeve **10** remote from the insertion end **13**.

[00015] Furthermore, the ~~bush~~ sleeve **10**, in the region where the cylindrical section **20** between the insertion end **16** and the groove **17** of the pipe nipple **12** is located in the coupled state, has an annular recess **21** into which a sealing O-ring **22** is inserted.

[00016] Serving to lock the pipe nipple 12 in the ~~bush~~ sleeve **10** in the coupling state shown in Figs. 1 and 2, is a locking ring **23** which is resilient in the radial direction, is split in the circumferential direction, and is dimensioned in such a way that its inner diameter in the released state is smaller than the outer diameter of the pipe nipple **12**. The locking ring **23** is located in an annular recess **24** which is formed in the ~~bush~~ sleeve **10** close to its insertion end 13 and has three successive regions **25**...**27** of different diameters.

[00017] The inner region **25** has an inner diameter which is slightly larger than the diameter of the pipe nipple **12** plus twice the radial thickness of the locking ring **23**. The inner diameter of the ~~centre~~ center region **26** of the annular recess **24** corresponds to the outer diameter of the groove **17** provided in the pipe nipple **12** plus twice the radial thickness of the locking ring **23**. The inner diameter of the outer region **27** of the annular recess **24** is smaller than that of the ~~centre~~ center region **26**.

[00018] If the pipe nipple **12** ~~is pushed sufficiently far~~ with its end section **20** is pushed sufficiently far into the through-hole **11** of the ~~bush~~ sleeve **10**, the groove **17** formed in the pipe nipple **12** passes into the region of the annular recess **24** provided in the ~~bush~~ sleeve **10**, and the locking ring **23** enters the groove **17** in which it latches in place due to its bias.

[00019] When the pipe nipple **12** is released, the compression spring **19**, which is compressed when said pipe nipple **12** is being pushed in, seeks to push the pipe nipple **12** outward, the locking ring **23** being urged into the ~~centre~~ center region **26** of the annular recess **24** until it abuts against the step between the ~~centre~~ center region **26** and the outer region **27** of the annular recess **24** in the position shown in Fig. 2. This is the fully coupled and locked position, in which the groove **17** of the pipe nipple is located completely within the ~~bush~~ sleeve **10**.

[00020] An unlocking tool consisting of two tubular halves, which may have the form shown in Fig. 12 of EP 0 467 381 A1 and is not shown here, may be used for releasing the coupling. The two tubular halves of this tool are so dimensioned that they can be passed through the gap between the outer region **27** of the annular recess **24** and the outside of the pipe nipple **12**. If the pipe nipple **12** is then pushed inward against the force of the compression spring **19** until the locking ring **23** faces the wider, inner region **25** of the annular

recess **24**, the locking ring **23** can be lifted out of the groove **17** of the pipe nipple by means of the tool, whereupon the pipe nipple **12** can be pulled out of the through-hole **11** of the ~~bush~~ sleeve **10**.

[00021] As shown in Fig. 1 of EP 0 467 381 A1, the unlocking tool may have the form of a sleeve movable on the pipe nipple and having a wall thickness corresponding to the gap between the outer region **27** of the annular recess **24** and the outside of the pipe nipple **12**. In order not to damage the coupling, such a sleeve is preferably made of plastic.

[00022] In the state shown in Fig. 3, the end section **20** of the pipe nipple **12 is** still ~~engages~~ in the ~~bush~~ sleeve **10**, and the O-ring **22** may bear against the end section **20** and effect a seal. In this state, however, the coupling is not locked, so that an unintentional relative movement between the ~~bush~~ sleeve **10** and the pipe nipple **12** may lead to leakage or even to complete release of the coupling. This non-locked condition can be readily ~~recognised~~ recognized visually, with the naked eye or by means of an imaging device, because the groove **17** of the pipe nipple **12** is visible outside the ~~bush~~ sleeve **10**.

[00023] In the second embodiment shown in Fig. 4, the pipe nipple **12**, instead of having the groove, has a projection **28** which can be formed, for example, as an annular bead by axial upsetting of the pipe nipple. In this case, the annular recess **34** provided in the ~~bush~~ sleeve **10** has two regions **35**, **37**, the inner diameter of the inner region **35** being slightly larger than the outer diameter of the annular bead **28** plus twice the radial thickness of the locking ring **23**. The inner diameter of the outer region **37** of the annular recess **34** corresponds to the outer diameter of the bead **28**; to be precise, it is only slightly larger than the latter, so that the pipe nipple **12** can easily be inserted. The outer region **37** and the outer surface of the pipe nipple **12** form a gap for inserting the above mentioned unlocking tool.

[00024] When the end section **20** of the pipe nipple **12** is pushed in against the force of the compression spring **19**, the locking ring **23,** held in place by the inner end face of the annular-recess region **35,** is lifted over the annular bead **28**. When the pipe nipple **12** is released, the compression spring **19** causes the locking ring **23** to be pressed against the opposite end face of the annular-recess region **35** by the bead **28** and the locking is effected.

[00025] If the pipe nipple **12** is not inserted sufficiently far into the ~~bush~~ sleeve so that no locking is not achieved, the compression spring **19** pushes the pipe nipple **12** out of the bush **10** to such an extent that the annular bead **28** remains visible outside the bush.

[00026] Since the annular locking recess **24** or **34** in both embodiments is located in direct proximity to the insertion end **13** of the bush **10**, the groove **17** or bead **28** is visible outside the ~~bush~~ sleeve **10** if no latching is effected. The groove **17** or bead **28** may be located, however, close to the insertion end **13** of the ~~bush~~ sleeve **10**.

[00027] The compression spring **19**, which defines the latched locking position shown in Figs. 1, 2 and 4, is so dimensioned that, in the unlocked state, it pushes the pipe nipple **12** out of the ~~bush~~ sleeve **10** to such an extent that the groove **17** or bead **28** is located at some distance from the insertion end **13** of the ~~bush~~ sleeve **10** and is therefore in any case clearly visible.

List of Reference Numbers

10	Bush
11	Through-hole
12	Pipe nipple
13	Insertion end of the bush **10**
14	External thread
15	Hexagon
16	Insertion end of the pipe nipple **12**
17	Groove in the pipe nipple **12**
18	Stop
19	Compression spring
20	End section
21	Annular recess for O-ring **22**
22	O-ring
23	Locking ring
24	Annular recess in the bush **10**
25	Inner region of the annular recess **24**
26	Centre region of the annular recess **24**
27	Outer region of the annular recess **24**
28	Annular bead
34	Annular recess in the bush **10**
35	Inner region of the annular recess **34**
37	Outer region of the annular recess **34**

Abstract

In a rapid coupling, an end section ~~20~~ of a pipe nipple ~~12~~ engages in a through-hole ~~11~~ of a ~~bush~~ sleeve ~~10~~. A groove ~~17~~ provided on the pipe nipple ~~12~~ serves to engage a resilient locking ring ~~23~~ formed in the ~~bush~~ sleeve ~~10~~ in order to lock the coupled state. The locking ring ~~23~~ is located in an annular recess ~~24~~ formed close to the insertion end ~~13~~ of the ~~bush~~ ~~10~~sleeve. If the pipe nipple ~~12~~ is not inserted into the bush ~~10~~ to such an extent that the locking ring ~~23~~ latches in the groove ~~17~~, the pipe nipple ~~12~~ is pushed outward by a compression spring ~~19~~ provided in the through-hole ~~11~~ of the ~~bush 10~~ sleeve, so that the groove ~~17~~ is readily visible outside the ~~bush 10~~sleeve. The groove ~~17~~ thus serves not only for locking in the properly coupled state but also as an indicator for indicating a state which is not properly coupled.